177 463 aboriginal and European products and techniques. Most of his modern handicrafts are based on pre-Conquest industries (ceramics; wood products; leathercrafts; metal work in copper; weaving of cotton, agave fiber, stalks of tule). Except in a few pueblos, European techniques are now used in making pottery. In modern woodwork [412] the adz and the lathe are probably European and cabinet work is practiced entirely with Old World techniques. Cattle hide and horse hide [281] have replaced deerskin in leathercrafts, but the tanning techniques used are possibly aboriginal. [286] Although the ancient belt loom is used for most cotton and agave weaving, for weaving wool the European hand loom is employed. Sleeping mats (*petates*) are woven of tule as they were 500 years ago; hat making, on the other hand, is completely European. In regard to metals, European tech- [325] niques have replaced native methods, and iron has of course been introduced. Spanish friars and master craftsmen of the 16th century did indeed teach Tarascans many new techniques, but in most instances such were applied to long-established native industries.

4: West K-5 (1946) 1948 NU34 Tarasco NU34
[P. 57-b]

438 178 [166] An interesting aspect of cottage industries is their ephemeral character. Owing to movement of artisan families from one pueblo to another and changes in markets and fashions, certain crafts disappear in some towns and reappear in others. In the last 160 years 37 Tarascan villages and *ranchos* have lost old crafts or gained new ones; 27 have retained their characteristic trades (table 2).[184] [323] The pottery industry in Santa Fé de la Laguna dates only from the last quarter of the 19th century, and in 1910 hat making was [294] brought into Jarácuaro by a few political refugees from Pichátaro. [282] A large number of Tarascan towns were famed for leathercrafts (saddles and shoes) during the 18th and 19th centuries, but now, owing to changes in transportation and the rise of factory production, local leather products have almost disappeared. [325] Again, the iron craft of San Felipe de los Herreros has practically vanished, for factory-made articles can be obtained more cheaply from surrounding mestizo towns.

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[184] Insufficient data were at hand to determine possible changes in home industries for 20 towns and ranches.

282 in the Tarascan area.[153] By the latter part of the
438 19th century leathercrafts began to decline, and today within the Tarascan area only Nahuatzen (largely mestizo) continues to tan hides and make saddles and other riding equipment.[154] Some Tarascan towns now boast of one or two *zapateros* who make huaraches of imported leather for local consumption. The principal huarache-making centers are now the surrounding mestizo towns: Coeneo, Zacapu, Tinguindín, Los Reyes, Uruapan, Ario de Rosales.

METALCRAFT

325 **Copper work.**—The Tarascans were probably the foremost metallurgists in pre-Columbian Mexico. They worked gold, silver, and copper. The precious metals were formed into ornaments and disks, which the *caltzontzin* stored on the islands in Lake Pátzcuaro; useful objects, such as axes, *coas*, and spearheads, were made of copper (Relación de Michoacán, pp. 104–109, 122–123). Although definite archeological evi-
325 dence is not yet at hand, it is probable that the
172 Tarascans purified native copper and extracted metal from simple oxide ores by smelting (Hendrichs, 1940, p. 327).[155] From cursory inspection of copper artifacts extant in the Museo Regional Michoacano, Morelia, it appears that Tarascans cast copper objects (axheads) in stone molds. After casting, the axes seem to have been further shaped and possibly hardened by hammering.[156] Accidental, rather than deliberate, alloying with tin and zinc probably occurred.

325 The Tepalcatepec and Balsas Basins contained
316 the ancient copper mines and metallurgical sites.
172 Hendrichs (1940, 1945–46) has described several probable ancient copper mines sites in both the

[153] AGN Tierras, vol. 83, exped. 13; Zavala and Castello, 1939–46, vol. 7, pp. 361–362; AGN Historia, vol. 73, ff. 178–179. The present northern Tarascan towns of Zipiajo, Arajo, Companja, Tatejero, Tirindaro, Naranja, and Teremendo were all producers of shoes and saddles in the latter part of the 18th and in the 19th century.

[154] Beals (1946, p. 44) states that in 1940 one person from Aranza was tanning hides in Cherán. The old men of Ocumicho remember the manufacture of the black "*zapatos de raqueta*" in their town during the last century. These were sold throughout the Sierra as well as in surrounding mestizo towns.

[155] The Lienzo de Jucutacato, a 16th-century representation of the migration of a people from the Gulf of Mexico into the Tarascan country (where they learned metallurgy) clearly depicts smelting of ore or metal (probably copper) apparently with the aid of charcoal and forced air draft (blowpipes) at the ancient copper center of Jicalán (Jicalán Viejo), 20 km. south of Uruapan.

[156] Microanalysis of Tarascan copperware has not yet been undertaken. Until the results of such analyses are known, it is impossible to make definite statements as to ancient metallurgical methods. Interestingly, the flange shape of the modern Tarascan steel axhead is identical with that of the copper axes found in archeological sites in the Balsas Basin.

325 172 316 southern and northern drainages of the lower Balsas (Guerrero). However, the mines of Inguarán in the northern drainage of the lower Balsas in Michoacán were the main source of the metal. Smaller deposits, such as those of Sinagua, were gophered over a wide area. The villages [438] of La Huacana, Jicalán, Sinagua, and possibly Tzatzio appear to have been the chief pre-Columbian copper refining centers.[137]

325 438 Needing copper for the manufacture of brass cannon, the Spaniards quickly levied tribute in copper bars on various pueblos in the Balsas and Tepalcatepec Basins. Later, adventurers (in the name of the Crown) took over the native mines [177] at Inguarán, probably introducing European smelting techniques. The main 16th-century Spanish smelting and refining center was Tzatzio, 10 miles each of Ario. This center was located within pine and oak forests, which afforded raw materials for charcoal, and was near the chief highway from Pátzcuaro to the *tierra caliente*. Copper ore and probably native copper was carried by Indians to Tzatzio from the Inguarán mines, which lay 15 miles to the south (AGN General de Parte, vol. 5, ff. 311–313, 1601). Tzatzio was probably an ancient copper center, and the experienced Tarascan metallurgists were retained by the Spaniards to continue with European methods. Before the end of the 16th century the Spanish Crown had established an *asiento* in the Michoacán copper industry, in order to insure a steady supply of metal for the foundaries in Mexico City.[138] Between 1607 and 1614

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[137] The Suma de Visitas, ca. 1540, state that the Spaniards exacted tribute of copper bars from La Huacana and Jicalán (Paso y Troncoso, 1905, vol. 1, pp. 123, 294). Moreover, every 20 days 20 Indians of Coyuca carried copper bars to Mexico (ibid., p. 80). Coyuca, located near the confluence of the Balsas and Cutzamala Rivers, may have been a collecting point for small lots of copper refined in various pueblos of the middle Balsas drainage. At the end of the 16th century copper was still being mined, refined, and made into tools at Sinagua (Mus. Nac., leg. 102, Rel. de Cinguacingo). Tzatzio was one of the first Spanish copper smelting centers in the area, and was probably an old Tarascan center as well (AGI Aud. de México, leg. 258). In passing, it should be noted that the old La Huacana was located near the Inguarán mines. In 1759 the town was destroyed by the eruption of Jorullo, and a new settlement, the La Huacana seen on modern maps, was established near Tamacuaro 15 miles west of the old site (AGN Historia, vol. 73, ff. 302-304)

[138] Under the *asiento*, or contract, system, control of various industries was farmed out to private individuals. In the case of the copper industry of Michoacán, administrative control was purchased from the Crown for 6-year periods. The administrator was obliged to furnish the Government a stipulated amount of copper annually at a fixed price. In 1599 an official survey was made of the copper industry in Michoacán. The surveyor recommended that owing to forest depletion around Tzatzio and the consequent difficulty in charcoal supply, refining operations should be moved to Ario, near abundant pine forests (AGI Aud. de Mexico, leg. 258). It is doubtful that this move was made, since in 1607 copper was still being refined at Tzatzio (Zavala and Castello, 1939-46, vol. 6, p. 166).

4: West K-5 (1946) 1948 NU34 Tarasco NU34
[P. 706]

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official copper refining operations had shifted 20 miles northward to Santa Clara (Villa Escalante), which has remained the copper center of Michoacán to this day (AGN Minería, vol. 22, exped. 3). In addition to copper bars for the royal artillery, the colonial administrators established the manufacture of caldrons and other copper vessels, which they sold to all parts of New Spain (AGN Historia, vol. 73, ff. 389).[159] Colonial copper production, however, was not limited to the royal refineries at Santa Clara, for as late as 1789 braziers were still being made by native coppersmiths at Jicalán (AGN Historia, vol. 73, f. 366). Moreover, some copperwork was done in Pátzcuaro throughout the colonial period.[160]

Today the sole survivors of the former Tarascan copper industry are some 30 mestizo coppersmiths in Santa Clara, where the renowned *casos* (caldrons), vases, and bowls are still manufactured. Ore or native copper is no longer refined; instead, scrap copper is purchased, melted down, and cast in earthen molds. Sixteenth-century hand bellows are still used to force an air draft; charcoal is employed for fuel. The cast vessel is finished and hardened by alternate annealing and hammering.

Ironworking.—With its concomitant tools (bellows, hammers, anvils, tongs, etc.), ironworking
[117] was introduced into Tarascan economy early in the 16th century. Curiously, one Sierra village, San Felipe de los Herreros, became the foremost ironworking center of Michoacán during the colonial period and the early 19th century. In 1644 bridle bits, spurs, locks and keys were fashioned and marketed in surrounding Spanish and mestizo towns (Basalenque, 1886, vol. 1, p. 467). As late as 1851, 68 families (practically the entire town) were professional smiths, supplying the countryside with plow tips, hoe blades, axheads, woodworking tools, etc. In 1946 three

[159] During the 17th century Tarascans from all parts of Michoacán were forced to work in the Inguarán mines and the *fundiciones* at Santa Clara. Most of the *fundidores* came from the *tierra caliente* and from the *tierra fría* towns of Zirósto and Pátzcuaro (Zavala and Castello, 1936-46, vol. 6, p. 166; vol. 7, p. 240). In 1789 there were 8 copper refineries at Santa Clara, each operated by 30 to 40 men (AGN Historia, vol. 73, f. 389).

[160] The Relación de Pátzcuaro of 1581 (p. 47) mentions "*herreros y calderos.*" Basalenque (1886, vol. 1, p. 451), writing in 1644, states that copper bells were made in Pátzcuaro. As late as 1862 (Romero (1862, p. 7) writes of Pátzcuaro coppersmiths, who were refining ore from Inguarán and Churumuco. Several new copper deposits in Michoacan were exploited during the last quarter of the 18th century, e. g., the mines of Apupato, near the old site of Urecho (AGN Historia, vol. 73, f. 388) and those of Chirangangueo, near Tuzantla, south of Zitácuaro (AGN Minería, vol. 62, exped. 1; Martínez de Lejarza, 1824, p. 92).

325 old smiths, who work at their trade only part time, represented the remnant of a once thriving home industry.

[439] The former source of metal for the San Felipe smiths is problematical. According to a local informant, during the 1880's *"planchas de hierro"* were brought in from Cotija, a muleteer and trade center having close connections with the *tierra caliente* and the Sierra of Guerrero. This information points to Coalcomán in the Sierra Madre del Sur of Guerrero as the principal source of iron. Other ironworking towns of Michoacán include Irimbo and Nahuatzen. Mestizos in the latter pueblo fashion knives and machetes.

STONECUTTING

324 Stonework among modern Tarascans is limited to approximately 12 metate makers in Turícuaro.
[438] Formerly this village was noted throughout Michoacán for the high-quality *metates* (iauári), *manos* (poɪékua), and *molcajetes* (šúmatakua) carved from a fine-grained andesite (ɬakápu amákiti, or "good stone"), found near the summit of the composite volcano Kanákuaráni (Cerro de la Corona) nearby. Since the introduction (ca.
[256] 1925) of the engine-powered nixtamal mills in mestizo and larger indigenous towns, demand for new *metates* has sharply declined.[161]

Metates and *molcajetes* are roughly shaped at the quarry on Kanákuaráni and are carried down to the pueblo on burro for finishing in the stonecutter's house. Stone is worked with steel tools,
[412] e. g. the pick (píkua) and sledge hammer (píkuak'éri), and is finished with a polishing stone (janámu). Several sizes of *metates* are made and sold to traveling merchants who pass through the town.

TRADE AND TRANSPORT

438 The structure of trade among the Tarascans is
441 not dissimilar to that of most Indian groups of central Mexico. Although every settlement has at least one store where general merchandise can be purchased, most trading is done at the *tianguis*, or market, held regularly in the larger towns. Throughout the area professional traders—*huacaleros* (who carry merchandise on their backs), *arrieros* (who haul products on the backs of burros), and lately, wholesale buyers from the

[161] According to local informants, in 1913 practically every family in the village made *metates*. Since that time most of the villagers have turned to woodwork (mainly bateas).

13: Phillips U-4 (no date) 1925
NU7 Aztec NU7
Tarasco NU434
Zapotec NU44

The Aztec people had, however, some knowledge of metallurgy, for they melted the copper and cast it in moulds, an art which the aborigines in the United States never seem to have acquired. Cortez tells us that in the markets of the City of Mexico

> "hatchets were sold made of copper alloyed with tin and that this alloy was used with a silicious powder with which they cut the hardest stones."

The Spanish historians speak of Cholula, a very ancient City of Mexico, founded before the arrival of the Aztec, which excelled in metal working, and that the Tarascans living west of the valley of Mexico were familiar with copper found in the mountains in that district, which they worked into defensive armor, body plates of wood covered with sheet copper. They also state that the Zapotec made ornaments of copper obtained from the mines in Oaxaca.

Copper implements, however, were not common near the City of Mexico but were plentiful in Oaxaca, Michoacan, and the Jalisco region. The T-shaped implements were found at Mitla, Central America, being abundant in the Zapotec country. The objects, some made of very thin sheet copper, others heavier, possibly cast, are of uncertain use; those too thin to be used as tools for wood or stone, are thought to be instruments used in their feather work or pottery, others regard them as a money currency or exacted as tribute paid to the City of Mexico by the neighboring cities, this latter being the general opinion.

The number as well as the variety of copper objects from Mexico found in our Museum collections, is rather limited, consisting of a few copper ax heads, chisels, large and small, little bells, finger rings, beads and pins. The peculiar T-shaped objects are the most abundant, differing somewhat in shape and size. An analysis of one of them in the Peabody Museum at Cambridge, proved it to be simply copper. It was doubtful if the ancient Aztec had a knowledge of bronze or knew how to obtain it until shown by the Spanish invaders, and such analyses of Mexican metal objects, giving a percent of tin to indicate a true bronze, may have been implements made after the instruction by the Spaniards. Some copper tools from Mexico when analyzed showed a small amount of tin believed to have been an impurity in the